J. F. MURPHY.

SPEED REGULATOR AND TIMER FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAR. 8, 1907.

955,667. **Patented Apr. 19, 1910.**

2 SHEETS—SHEET 1

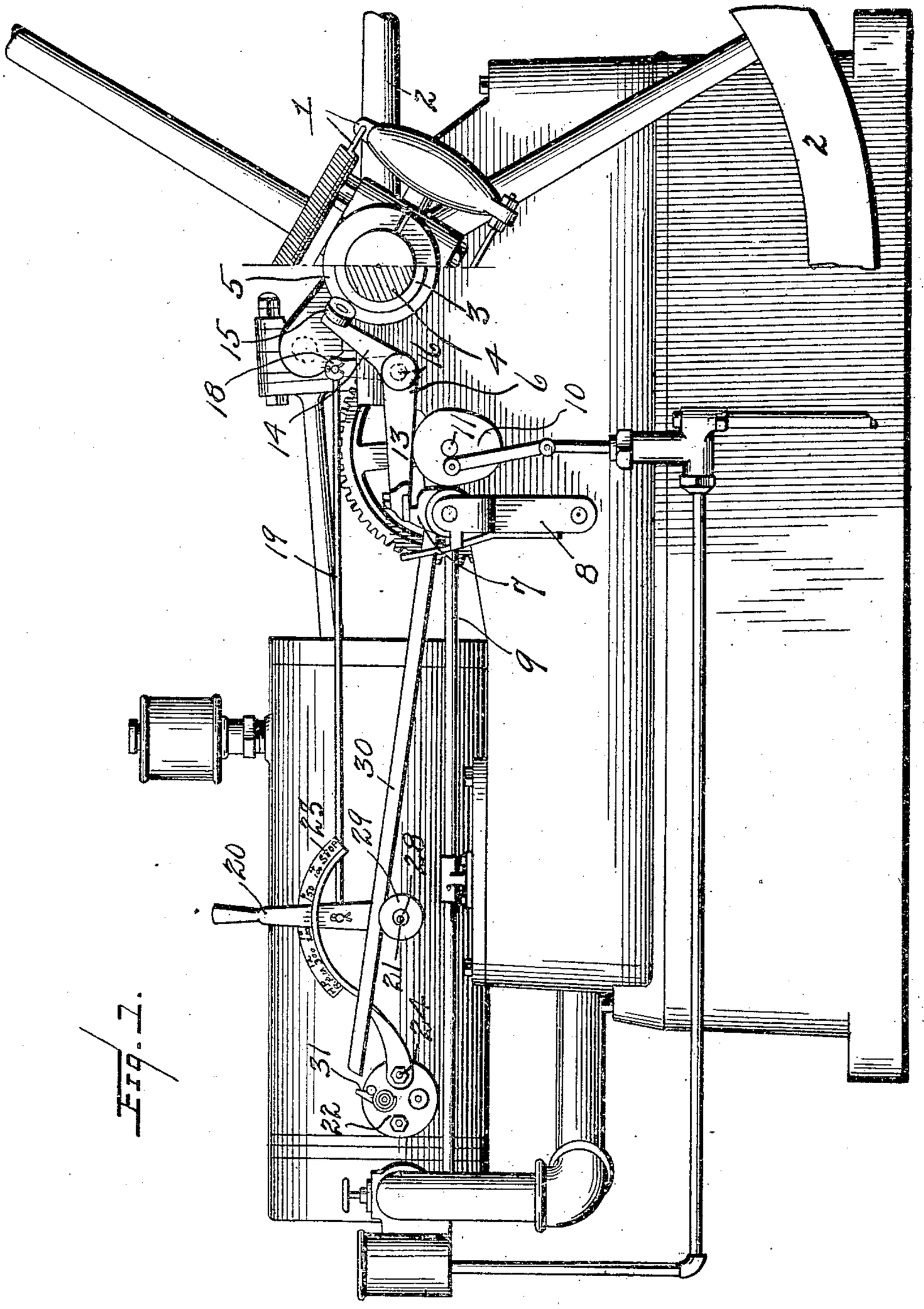

Fig. 1.

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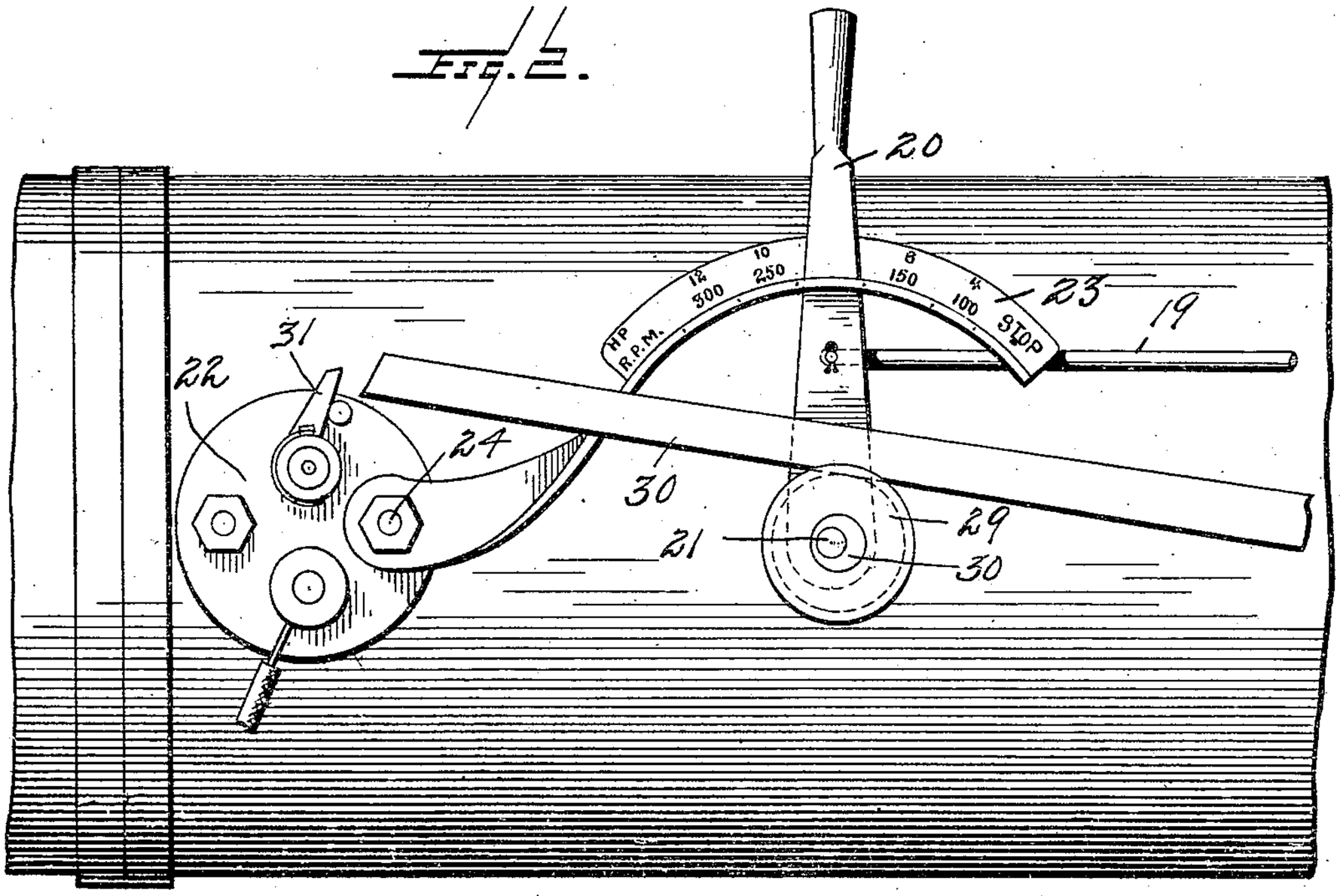
2 SHEETS—SHEET 2.

FIG. 2.



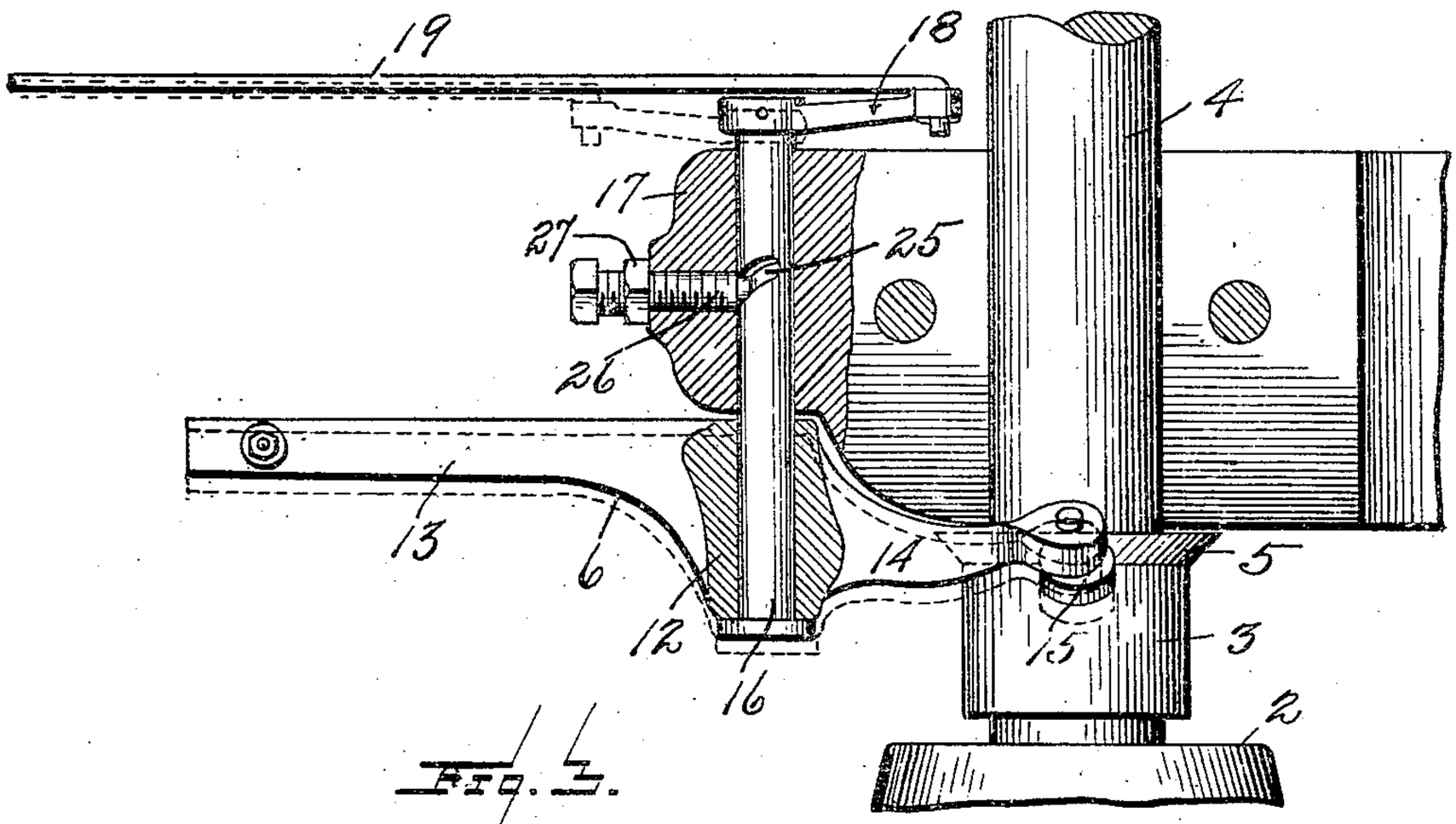


FIG. 3.

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SPEED REGULATOR AND TIMER FOR EXPLOSIVE-ENGINES.

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Application filed March 8, 1907. Serial No. 361,278.

To all whom it may concern:

Be it known that I, JOHN FRANCIS MURPHY, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Speed Regulators and Timers for Explosive-Engines, of which the following is a specification.

This invention relates to the subject of explosive engines, and has special reference to means for regulating or controlling the speed thereof, and also the time of firing to insure economy in operation at all speeds.

To this end the invention primarily has in view a simple, practical, and thoroughly effective regulator and timer combined, having a positive and reliable action and providing means whereby, even in the hands of an inexperienced mechanic or attendant, the highest efficiency of the engine may be attained at all speeds within the range of the device. In this connection the invention provides means for positively and reliably controlling the speed of the engine, and at the same time providing for the control of the time of firing, inasmuch as it is necessary, when the speed of an explosive engine is changed, that the time of firing for the explosive charge be also changed in harmony therewith to insure proper economy in the operation at all speeds of the engine.

Heretofore, manufacturers have found in introducing explosive engines for general purposes, a demand for a reliable regulator permitting the speed to be changed to suit the various machines used and the conditions met in their operation, whereby, under certain conditions, the machine might be run at full speed, while under other conditions a slower speed would be required. This difficulty has been partly obviated by adapting the regular ball governor of steam engines for use on internal combustion motors, but a difficulty peculiar to the explosive motor which must be taken into consideration, is that in the latter the pressure is intermittent and generated in the cylinders themselves, and while it takes only a short time to produce the explosion, nevertheless, no matter how short that time may be, it is quite important that these explosions be timed in harmony with the speed so that the force of the combustion may be utilized when the piston and crank are in the best position to transmit it. If the charge is fired at just the right point before the piston reaches dead center, so that complete combustion takes place and full pressure is generated and used during the working stroke, it can be readily seen that, either to increase or diminish the speed, would make the engine less economical, because the time necessary to burn the charge, after sparking, remains the same, and the machinery would be out of time with the explosion. If the speed was increased, the piston would be partly out on its working stroke and a part of the force would be wasted. If the speed was decreased, the piston would receive the explosive impulse before it reached the end of the instroke, and a large part of the force would be expended in increased strains on the working parts.

The foregoing factors are taken into consideration by the present invention which combines a speed control or regulation with a means for changing the time of firing to harmonize with the change in speed of the motor.

With these and many other objects in view, which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated and claimed.

The essential features of the invention, involved in carrying out the objects above indicated are necessarily susceptible to a wide range of structural modification without departing from the scope of the invention, but a preferred embodiment thereof is shown in the accompanying drawings, in which:

Figure 1 is a side elevation of an explosive engine, showing a section of the fly wheel and governor and illustrating the improved regulator and timer in its applied position. Fig. 2 is an enlarged detail elevation of the sparking device and the timing controller therefor. Fig. 3 is an enlarged plan view, partly in section, of the valve controlling speed regulating mechanism.

Like references designate corresponding parts in the several figures of the drawings.

The improvements contemplated herein may be associated with any approved type of internal combustion engine and adapted for coöperation with any form of speed governor of the throttling, or hit and miss type.

But, for illustrative purposes the invention is shown, in the drawings, applied to an internal combustion or explosive engine equipped with a governor of the hit and miss type, and which governor includes the usual governing elements 1 carried with the fly wheel 2, and influencing the movement of the governor sleeve 3 slidably mounted on the crank shaft 4 of the engine upon which shaft is mounted said fly wheel in the usual way. The operation of this governor in causing the sleeve 3 to move inward or outward, according to the speed of the engine, is well known and well understood, so a detailed description thereof is unnecessary, but for the purposes of the present invention, the sliding governor sleeve 3 on the crank shaft 4 is provided with a cone bearing face or collar 5 which coöperates directly with a rocking detent lever 6 designed to be interposed between the plane of the crank shaft 4 and the shouldered hook-up stop 7 carried at the upper end of a swinging carrier arm 8 to which is also connected the reciprocal valve rod 9 which connects with and controls the movement of the exhaust valve of the engine in the usual manner, said carrier arm 8 and the rod 9 connected therewith being operated from a valve controlling cam 10 on one of the shafts 11 of the engine. No claim is made herein to these parts of the engine, but it will be observed from the foregoing that the rocking detent lever 6 occupies an operative position between the valve rod 9 and its operating parts, and the sliding governor sleeve 3 on the crank, so that when the speed of the engine becomes abnormal, the detent lever 6 may be operated to interlock with the hook-up stop 7 and thereby prevent movement of the exhaust valve rod 9 and thus hold the exhaust valve open.

The above will be more particularly referred to, but at this point attention is directed to the fact that the rocking detent lever 6 essentially consists of an intermediate bearing collar 12, a locking arm 13 located at one side of the vertical plane of the cam 10 and projecting from one side of said collar, and an operating arm 14 projecting from the other side of the collar and at an obtuse angle to the arm 13, said operating arm 14 carrying at its extremity a contact or detent roller 15 which engages with the cone collar or bearing face 5 of the governor sleeve 3.

A distinctive feature of the invention resides in journaling the rocking detent lever 6 on a longitudinally shiftable support or journal. This may be accomplished by fitting the bearing collar 12 of the detent lever on one end portion of a shiftable journal rod 16 slidably mounted in a guide bearing 17 on the engine frame and having fitted to the end opposite the detent lever a crank or equivalent arm 18 to which is connected one end of a pull rod or equivalent element 19. The other end of this rod or element 19 is connected to an operating lever 20 supported at one end on a pivot post 21 projecting from one side of the engine body in proximity to the sparking device 22, to be presently referred to. The operating lever 20 is arranged to play within and engage the locking quadrant 23 which may be conveniently supported at one end as at 24 on the base of the sparking device and which is provided with notches or equivalent retaining means for holding the lever in any set position. Also, the said locking quadrant is preferably provided with a properly graduated index preferably showing both the speed and the horse power developed.

To provide for the longitudinal movement, or axial shifting, of the journal rod 16 supporting the detent lever, there is preferably employed a cam device of some suitable type, such for instance as shown in the drawings, which illustrates the rod 16 provided with a spirally arranged camming slot 25 working over a fixed stud 26 which may conveniently be in the form of an adjustable screw mounted in one side of the guide bearing 17 and provided with a lock or jam nut 27. By reason of this construction, it will be obvious that after the journal rod 16 is turned through the medium of the operating lever 20 and its connections, the same is shifted axially with the result of carrying the detent lever toward or from the cone collar 5 of the governor sleeve.

Another feature of the invention referred to is that of a timing controller for the sparking device of the engine, and this timing controller preferably embodies the operating lever 20 as a part thereof. That is, according to one practical embodiment of the invention, the valve lever 20 is connected with a rotatable eccentric adjusting sleeve 28 journaled on the pivot post 21 and upon which sleeve is mounted a supporting and guiding roller 29 for the movable igniter rod 30 of the sparking device. This movable igniter rod 30 is operated from an eccentric or other moving part of the engine in the usual way and is designed to wipe over and trip past the exterior electrode trip arm 31 of the sparking device 22. It will thus be seen that the movement of the lever 20 not only provides for shifting the journal rod 16, but also raises or lowers the support for the igniter rod 30, thus causing said rod to slip off the electrode trip earlier or later in the revolution, as the case may be.

From the construction described, it will be obvious that the effect of the adjustment of the rod 16 is to permit the governor to work under greater tension, caused by higher speed if moved toward the sleeve, and under less tension if moved from the sleeve, and if continued far enough, it would cause the de-

tent arm to become locked at all speeds, and therefore afford a convenient method of stopping the engine when desired.

It is thought that the construction, operation, and many advantages of the herein described combined speed regulator and timer will be readily understood by those familiar with the art, without further description, and it will also be understood that various changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

I claim:

1. In a regulator of the class described, the combination with the sparking device, the governor sleeve and the engine valve rod, of a detent lever interposed between the governor sleeve and valve rod and arranged to lock said valve rod against movement and operated from said sleeve, means for moving the detent lever laterally toward or from the governor sleeve and a timing controller coöperating with said means.

2. In a regulator of the class described, the combination with the sparking device, the governor sleeve and the valve rod of the engine, of a rocking detent lever arranged to lock the valve rod against movement and operated from the governor sleeve, an axially shiftable journal support for the lever and a timing controller coöperating with said shiftable support.

3. In a regulator of the class described, the combination with the sparking device, the governor sleeve and the valve rod of the engine, of a rocking detent lever arranged to lock the valve rod against movement and operated from said sleeve, an axially shiftable journal support for the detent lever, a cam device for said support, means for turning said support to cause the cam device to shift said journal axially and a timing controller coöperating with said means.

4. In a regulator of the class described, the combination with the sparking device, the governor sleeve and the exhaust valve rod of the engine, of a rocking detent lever arranged to lock the valve rod against movement and operated from said governor sleeve, a slidably supported journal rod carrying thereon the detent lever and provided in its body with a spiral cam slot, a fixed projection engaging said slot, a suitably supported operating lever having an operating connection with said journal rod for partially rotating the same and a timing controller coöperating with said means.

5. In a combined speed regulator and timer for explosive engines, the combination with the speed governor and exhaust valve of the engine, of a shiftable detent controlled by said governor and adapted to lock said valve, a sparking device, means separate from the governor for operating the sparking device, a timing controller for the sparking device, and a manual device directly connected with said timing controller and said detent, whereby the detent may be shifted with reference to the governor and the timing controller simultaneously adjusted in harmony therewith.

6. In a combined speed regulator and timer for explosive engines, the combination with the engine, of speed regulating mechanism operated thereby, ignition mechanism for said engine operated by the engine, a manually operated adjusting device movable to different positions, a connection between the adjusting device and the speed regulating mechanism, and a separate connection between the adjusting device and the ignition mechanism to effect their simultaneous movement upon the movement of the adjusting device, thus varying the action of said speed regulating and ignition mechanisms.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JOHN FRANCIS MURPHY.

Witnesses:

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JAS. PENDERGAST.